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RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, postpaid (domestic and foreign); single copies (if available) 20 cents. Volumes 1–8 or single numbers from them can be supplied at somewhat advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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CONTRIBUTION FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXVII

(*Continued from page 11*)

III. A REVISION OF SOME NORTH AMERICAN SPECIES OF CALAMAGROSTIS

G. L. Stebbins, Jr.

(Plate 195)

The genus *Calamagrostis* is well known to students of grasses as one in which the species are exceedingly variable and difficult to define. The North American species, mostly boreal or alpine in distribution, have been studied by a number of the best known American grass specialists, in particular Dr. George Vasey, Dr. F. Lamson Scribner, and Dr. T. H. Kearney. The first attempt at a complete classification of the genus in North America, however, was made by Dr. Kearney in 1898.[1] This monograph did a great deal toward clearing up the confusion of names that had existed before this time, and it is the basis for the treatment of the genus in most of the manuals and local floras now in use.

The subdivision of the genus in Kearney's monograph is in many ways unsatisfactory, since it is based to a considerable extent on characters such as the expansion or contraction of the panicle and the flatness or involuteness of the leaves, characters which obviously vary with the habitat of the plant, and, in herbarium specimens, the manner in which the specimen was prepared. For a more sound

[1] T. H. Kearney—The Genus Calamagrostis in North America, Bull. U. S. Dept. Agric. Div. Agrost. xi. (1898).

subdivision of the genus it seems advisable to turn to European works, in which a number of subgenera and sections have been described. The treatment in Ascherson & Graebner's "Synopsis der Mittel-Europäischen Flora" (Vol. II, part 1, pp. 197–223) is probably the most satisfactory, and the description there given of the sections of the division *Quinquinerviae* of the subgenus *Eucalamagrostis*, the only division extensively represented in North America, is therefore quoted in translation:

a. *Quinquenerviae* Torges Thür. BV. N. F. XII f. 1898. 23 [1899]). Glumes lanceolate, acuminate. Lemmas mostly 4-nerved above the insertion of the awn.

1. *Calamágris* (Dumortier Agrostogr. Belg. 126 [1823]. *Homoeotricha* Torges Thür. BV. N. F. XII f. 1898 23 [1899]). Callus-hairs spread equally around the callus, forming a closed ring of hairs, and of equal length all around (the larger and straighter ones scattered throughout). Lemma considerably, mostly ⅓, shorter than the lower glume, completely, or at least in the upper ½ or ⅓ translucent-membranaceous. Awn delicate, straight, only in rare exceptions weakly geniculate. Palea considerably shorter than the lemma. Rhachilla not prolonged behind the floret, or the prolongation persisting as a short (rarely longer) hairy (rarely glabrous) little point.

2. *Deyeuxia* ([Clarion in P. B. Essai d'une nouvelle Agrost. 43. t. IX fig. 9, 10 [1812] as a Genus]. Torges Thür. BV. N. F. XII f. 1898 23 [1899] as a Section). Callus-hairs quite or almost completely interrupted below the middle of the lemma (through one group of scanty probably shorter hairs), the longest hairs situated on either side of the lemma and more or less crowded together, appearing tufted. Lemma almost always very slightly shorter (⅙–⅛) than the lower glume, toward the tip, the edges, and between the nerves translucent, otherwise chartaceous, herbaceous and more or less firm. Awn setiform, distinctly geniculate and twisted above the base, or straight and only exceptionally and indistinctly geniculate and weakly twisted. Palea little to considerably shorter than the lemma. Rhachilla always prolonged behind the base of the floret, above (in our species) with brush-like hairs.

a. Orthoátherae Torges Thür. BV. N. F. XII (1898). 24 (1899). Awn straight, only exceptionally indistinctly geniculate. Palea considerably (¼–⅓) shorter than the lemma.

b. Ancylátherae (Torges Thür. BV. N. F. XII [1898]. 24 [1899]). Awn geniculate and twisted. Palea almost as long as the lemma.

These subdivisions seemed to be based on more fundamental characters than those of Kearney, and a revision of § *Calamagris*, and § *Deyeuxia*, Subsect. *Orthoatherae* was undertaken with them as a basis. The *Ancylatherae*, most highly developed in the Condilleran Region and in South America, have been omitted on account of their great complexity and their scant representation in eastern America.

It was soon found, however, that some of the characters mentioned above do not hold for the American species. *Calamagrostis Scribneri*

Beal has the short, unequal callus-hairs of § *Deyeuxia*, although its thin, translucent-membranaceous lemma would place it in § *Calamagris*, and its habit is most nearly like that of *C. canadensis*, our most widely spread representative of that section. The lemma is, moreover, just as much shorter than the glumes in the species of *Deyeuxia* as in *Calamagris*, while the prolongation of the rhachilla is present in all species, and is quite as long in some varieties of *C. canadensis* (Michx.) Nutt. as in the majority of the species of the section *Deyeuxia*. The fundamental character separating the two sections, however, the texture of the lemma, is a constant one which, together with the difference in general habit, separates them quite definitely.

This paper deals with the species of the section *Calamagris* and of the subsection *Orthoatherae* in North America. The species are all highly variable, and intermediate forms between many of them were found. In fact, it would probably be possible in any of the subsections to form a continuous series of forms differing but slightly from each other which would include all of the species of the subsection. Species have, therefore, been recognized wherever a clearly definable entity exists with a definite range, and with only a few intermediates between it and closely related forms. Where species already described have been found to pass imperceptibly into related species, with many intermediates where their ranges overlap, it has seemed advisable to relagate them to varieties, even though, in their typical forms, they are quite distinct from each other. *Calamagrostis Langsdorfi* (Link) Trin. is therefore treated, following Inman (Rhodora, xxiv. 143), as a variety of *C. canadensis* (Michx.) Nutt., while *C. Macouniana* Scribn. and *C. micrantha* Kearney have been made varieties of *C. canadensis* and *C. neglecta* (Ehrh.) Gaertn. respectively.

In view of these facts, there is little doubt that closely related species of this genus hybridize with each other, and that this is one cause of the complexity of the genus. Some of the species which have been collected only once or twice may be hybrids between more distantly related species, while a few forms obviously intermediate in their characters will be discussed as such.

The following treatment is the result of the examination of the specimens in the Gray Herbarium, the herbarium of the New England Botanical Club (cited as N. E.) and of the types and the more critical specimens in the United States National Herbarium (cited as U. S.), the herbarium of the New York Botanical Garden, and the National Herbarium of Canada.

KEY TO THE SPECIES OF CALAMAGROSTIS § CALAMAGRIS AND § DEYEUYIA, SUBSECTION ORTHOATHERAE IN NORTH AMERICA

a. Panicle mostly loose and open; the branches spreading at flowering time: lemma membranaceous-translucent, at least in its upper third: the nerves prominent: awn straight....*b.*

b. Sheaths glabrous at the summit: tip of the lemma erose or 4-toothed; the teeth obtuse or acute: callus-hairs equalling or exceeding the lemma, of approximately equal length, except for an outer ring of shorter hairs.....1. *C. canadensis.*

b. Sheaths bearded at the summit, or more rarely glabrous: lemma sharply 4-toothed; the teeth acuminate through the excurrence of the nerves: callus-hairs distinctly shorter than the lemma, somewhat unequal in length..2. *C. Scribneri.*

a. Panicle sometimes loose and open, more generally narrow and contracted; its rigid branches appressed or ascending even at flowering time: lemma firm and opaque, if occasionally translucent the awn strongly bent and twisted; the nerves frequently indistinct: callus-hairs usually shorter than the lemma, of markedly unequal length; those at the sides of the lemma distinctly longer and tufted: awn straight, or bent and twisted....*c.*

c. Awn straight or slightly bent: palea ⅔–⅘ as long as the lemma....*d.*

d. Prolongation of the rhachilla bearded only at the summit: caryopsis pubescent, particularly at the summit.3. *C. cinnoides.*

d. Prolongation of the rhachilla bearded throughout its length: caryopsis glabrous....*e.*

e. Leaves broad, flat and lax: glumes translucent, pale and whitish: palea 3.5–4 mm. long, ⅘ as long as the lemma.....4. *C. scopulorum.*

e. Leaves firmer and more rigid, flat or involute: glumes opaque, or if translucent distinctly green, yellowish, or purple-tinged: palea rarely over 3 mm. in length....*f.*

f. Foliage and culms harsh and scabrous: ligules of the upper culm-leaves 2.5–8 mm., averaging 4 mm., long; their margins erose or lacerate....*g.*

g. Branches of the panicle slender and flexuous, very slightly scabrous: spikelets 3 mm. long: prolongation of the rhachilla 0.5 mm. long..5. *C. lucida.*

g. Branches of the panicle stout, rigid, strongly scabrous: spikelets 3–6 mm. long: prolongation of the rhachilla 0.6–1.5 mm. long.....6. *C. inexpansa*

f. Foliage smooth, the leaves occasionally scabrous on the tip, the margin, and the upper surface: ligules of the upper culm-leaves 1.5–3.5, averaging 2 mm., long: their margins entire or slightly erose, truncate....*h.*

h. Culms stout: culm-leaves 3–4 mm. broad, flat or involute: panicle short and very dense, 5–8 cm. long....*i.*

i. Culm-leaves involute, at least in drying, 4–13 cm., the upper averaging 4–6 cm., long: glumes very thick and broad, 2 mm. broad when laid out flat: palea ⅘ as long as the lemma: species of the Pacific Coast. 7. *C. crassiglumis.*

i. Culm-leaves flat, 10–14 cm., the upper averaging 10–12 cm., long: glumes thinner, often hyaline at the tip and on the margins, narrower: palea ¾ as long as the lemma: species of Greenland....8. *C. hyperborea.*

h. Culms more slender: culm-leaves 2–3 mm. broad, involute at least in drying, if occasionally flat and over 3 mm. broad, the panicle loosely flowered and 9–15 cm. long.*j.*

j. Glumes thick and opaque, 1.4–1.8 mm. broad when flattened out: branches of the panicle very short, the longest ⅕ its length.....9. *C. labradorica.*

j. Glumes hyaline and translucent, at least at the tip and on the margins, 1–1.2 mm. broad: branches of the panicle mostly longer, ⅕–⅓ its length....*k.*

k. Spikelets 2–4.8 mm. long:[1] lemma 1.8–3.8 mm. long: palea 1.2–2.5 mm. long: awn straight.....10. *C. neglecta.*

k. Spikelets 4.5–5.5 mm. long: lemma 3.8–4 mm. long: palea 2.8–3 mm. long: awn curved or weakly geniculate, not twisted.....11. *C. lapponica.*

c. Awn strongly, or at least once or twice twisted at the base, and distinctly bent or geniculate: palea nearly or quite equalling the lemma.....Subsection *Ancylatherae.*

1. Calamagrostis canadensis (Michx.) Nutt. Gen. i. 46 (1818). A very variable species, of which the following are well marked varieties:

a. Glumes green or purple-tinged, equal or nearly so: awn inserted on the lower two-thirds of the lemma....*b.*

b. Spikelets 2–3.8 mm. long: glumes rounded on the back, weakly keeled, acute or acuminate: lemma 1.7–3 mm. long: awn inserted near the middle of the lemma....*c.*

c. Panicle loosely flowered: spikelets 2.8–3.8 mm. long: glumes distinctly exceeding the lemma, acute or acuminate.....Var. *typica.*

c. Panicle densely flowered: the ultimate branchlets short and and appressed: spikelets 2.2–2.8 mm. long: glumes nearly or quite equalled by the lemma, obtuse or acute. Var. *Macouniana.*

b. Spikelets 3.8–6 mm. long: glumes narrow, strongly keeled, and distinctly acuminate: lemma 3–4.2 mm. long: awn inserted on the lower third of the lemma....*d.*

d. Spikelets 3.8–4.5 mm. long: glumes often hyaline on the tip and on the margin, short-scabrous on the keel, elsewhere minutely pubescent-scabrous: lemma 3–3.5 mm. long.....Var. *robusta.*

d. Spikelets 4.5–6 mm. long: glumes usually thick and opaque throughout, scabrous or ciliate on the keel, elsewhere pubescent: lemma 3.5–4.2 mm. long....*e.*

[1] In all the species, the length of the spikelets varies considerably in the same panicle, those at the base being considerably shorter than those at the summit. For the sake of uniformity, the measurements are in every case based on spikelets taken from the middle of the panicle.

e. Culm-leaves broad and flat; their ligules 4–10 mm. long: panicle expanded at flowering time: glumes ciliate on the keel, elsewhere distinctly and rather densely pubescent ..... Var. *Langsdorfi.*

e. Culm-leaves involute, at least in drying; their ligules 1.5–3 mm. long: panicle narrow and contracted, even at flowering time: glumes short-scabrous on the keel, elsewhere minutely and sparsely pubescent .. Var. *arcta.*

a. Glumes membranaceous and translucent on the tip and the margins, pale-green or whitish, distinctly unequal, the upper more acuminate than the lower: awn inserted on the upper fourth of the lemma, considerably exceeding it ..... Var. *blanda.*

Var. **typica.** *C. canadensis* (Michx.) Nutt., as to synonymy. *Arundo canadensis* Michx. Fl. Bor.-Am. i. 73 (1803). *Agrostis mexicana* Pers. Syn. i. 76 (1805). *C. canadensis*? Beauv. Agrost. 157 (1812), as *nomen nudum*. *Arundo agrostoides* Pursh, Fl. Am. Sept. i. 86 (1814). *C. mexicana* Nutt. Gen. i. 46 (1818). *C. agrostoides* Trin. Gram. Unifl. 228 (1824). *Cinna? Purshii* Kunth, Enum. i. 208 (1833). *Arundo fissa* Willd., Steud. Nom. ed. 2, i. 44 (1840). *Calamagrostis Michauxii* Trin., Steud. Nom. ed. 2, i. 250 (1840). *C. canadensis campestris* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 31 (1898). *C. inexpansa cuprea* Kearney, ibid. 37 (1898).—Newfoundland to British Columbia, south to Delaware, Ohio, Missouri, New Mexico, and California. The following are typical: Newfoundland: talus of sandstone cliffs, Western Bay, Conception Bay, *G. S. Torrey*, no. 112. Quebec: Rivière Moisie, sur les alluvions près de l'embouchure, *Victorin & Rolland*, no. 18,200; Ile Plâte, near Montreal, *Victorin*, no. 734; swamp, Ascot, Sherbrooke Country, *E. B. Chamberlain & C. H. Knowlton*, July 29, 1923; Arbor Vitae swamp west of Locked Camp, Rivière Cap Chat, Matane County, *M. L. Fernald & L. B. Smith*, no. 25,478; tourbière, Pointe Sud Ouest, Anticosti, *Victorin & Rolland*, no. 24,372. New Brunswick: Shediac Cape, *F. T. Hubbard*, no. 722; Lily Lake, St. John's, *William Boott*, August 8, 1873. Maine: Green Mt., Mt. Desert Island, *E. & C. E. Faxon*, July 26, 1888; Kennebunkport, *G. G. Kennedy*, July 18, 1888. New Hampshire: in deep, wet woods, Jaffrey, *B. L. Robinson*, no. 353; roadside north of Crawford House, *E. & C. E. Faxon*, July 27, 1895; Breezy Point, Warren, *E. F. Williams*, July 24, 1908. Vermont: along the Connecticut River, Norwich, *E. F. Williams*, July 11, 1910; Smuggler's Notch, *C. E. Faxon*, August 10, 1877. Massachusetts: Revere, *H. A. Young*, June 24, 1879; Neponset Meadow, Canton, *G. G. Kennedy*, June 26, 1894; Holbrook, *J. M. Greenman*, no. 3152. Rhode Island: Cat Swamp, Providence, *J. F. Collins*, July 2, 1893. Connecticut: Southington, *L. Andrews*, no. 634; wet meadow, Columbia, Tolland County, *C. A. Weatherby*, no. 4088 (N. E.). New York: Stony Creek Ponds, Adirondack Mountains, *W. W. Rowlee, K. M. Wiegand, & G. T. Hastings*, July 10, 1899; shore of Oneida Lake, South Bay, Madison County, *H. D. House*, June 14, 1918; summit marsh, Spencer, Tioga County, *F. P. Metcalf*, no. 5674; Fisher's

Island, Suffolk County, *Harold St. John*, no. 2556. PENNSYLVANIA: along wet ditch, Quakertown, Bucks County, *W. M. Benner*, June 17, 1922. DELAWARE: Newcastle, *Edward Tatnall*. ONTARIO: Sharbot Lake, *J. Fowler*, July 16, 1898; Plevna, *J. Fowler*, July 26, 1902. MICHIGAN: sandy shore of Douglas Lake, Cheboygan County, *J. H. Ehlers*, no. 538; Isle Royale, *W. S. Cooper*, no. 169. OHIO: swamp at Cedar Point Hotel, Sandusky, *E. L. Morris*, no. a.67. INDIANA: slough, Millers, *O. E. Lansing, Jr.*, no. 2729. WISCONSIN: Point Sable, Green Bay, *J. H. Schuette*, July 19, 1883. ILLINOIS: in a drained tamarack swamp, Lake Villa, *H. A. Gleason & F. D. Shobe*, no. 116. MINNESOTA: Star Island, Cass Lake, *L. H. Pammel, H. E. Pammel & P. S. McNutt*, no. 824. IOWA: Ames, *C. R. Ball*, no. 133; Spirit Lake, *L. H. Pammel*, no. 555. MISSOURI: Buckner, *B. F. Bush*, no. 6763. SOUTH DAKOTA: Hill City, *David Griffiths*, no. 740. NEBRASKA: Scotia, *J. M. Bates*, June 22, 1908. MONTANA: Big Fork, Flathead Lake, *Mrs. Joseph Clemens*, July 22, 1908. IDAHO: near Britton, St. Joseph's River, *J. B. Leiberg*, no. 1299. WYOMING: Laramie River, Albany County, *Elias Nelson*, no. 442. COLORADO: Gunnison, *C. F. Baker*, no. 554. NEW MEXICO: Ponchuelo Creek, *P. C. Standley*, no. 4184. WASHINGTON: Big Meadows, Ione, *Frank O. Kreager*, no. 411. BRITISH COLUMBIA: above snowsheds, Glacier, *Stewardson Brown*, no. 630.

Typical *Calamagrostis canadensis*, common throughout the northern United States and southern Canada, is quite constant and distinct in the southern part of its range, but in northern New England, the Gulf of St. Lawrence region, and in the Rocky Mountains passes imperceptibly into the forms with larger spikelets, while in the Great Plains and the Mississippi Valley it grades equally imperceptibly into forms with smaller spikelets and blunter glumes. It seems best, therefore, to regard all of these forms as geographic varieties of a single species rather than to split species on characters which do not hold for a large percentage of intermediate forms.

Var. **Macouniana** (Vasey), n. comb. *Deyeuxia Macouniana* Vasey, Bot. Gaz. x. 297 (1885). *C. Macouniana* Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 81 (1892).—Prince Edward Island and locally along the Atlantic Coast to New Jersey; and from Saskatchewan to Alberta and Montana, south to Missouri. Specimens examined: PRINCE EDWARD ISLAND: fresh or slightly brackish reclaimed marshes along Hillsborough River, Mt. Stewart, *M. L. Fernald et al.*, no. 6857. MASSACHUSETTS: swampy woods, Brewster, *M. L. Fernald and Bayard Long*, no. 17,936. CONNECTICUT: Hartford, *A. W. Driggs*, July 18, 1900. NEW JERSEY: Delanco, Burlington County, *Bayard Long*, August 10, 1909. MISSOURI: Lake City, *B. F. Bush*, no. 6839. NORTHWEST TERRITORY: borders of marshes, *J. Macoun*, 1883. NORTH DAKOTA: Leeds, Benson County, *J. Lunell*, July 13, 1902.

There seems to be no sharp difference between *Calamagrostis Macouniana* Vasey and *C. canadensis*. The spikelets are smaller in the former, and the glumes less acute, but forms with spikelets intermediate in both characters are common. The original material from Assiniboia, and the specimens from North Dakota and Missouri have narrow leaves and short, more contracted panicles, but these characters, are by no means constant, and the specimens from the Atlantic coast, while having the spikelets of *C. Macouniana*, have broad leaves and longer panicles, although the panicle is still more densely flowered than in typical *C. canadensis*. O. L. Inman (Rhodora, xxiv. 143) states, in addition to these characters, that the palea and lemma are subequal in *C. Macouniana*, but the writer has found the same range of proportions between the lengths of the two as in typical *C. canadensis*, and the original description of *C. Macouniana* states that the palea is ⅓ shorter than the lemma. *C. Macouniana*, therefore, is not distinct enough from *C. canadensis* to be considered a separate species.

Var. robusta Vasey in Rothr. in Wheeler Rep. vi. 285 (1878). Var. *acuminata* Vasey in Rydberg & Shear, Bull. U. S. Dept. Agr. Div. Agrost. v. 26 (1897).—Labrador to Alaska, south to northern New England, New York, the mountains of North Carolina, Ontario, Isle Royale, Michigan, and in the mountains to New Mexico, and California. Also northern Asia. The following are typical: Labrador: Kikkertasoak Island, Saglek Bay, *R. H. Woodworth*, no. 58; Hopedale, *J. D. Sornborger*, no. 242; boggy thickets, Forteau, *Bayard Long*, no. 27,487. Newfoundland: wet places along the railroad, Stephenville Crossing, *K. K. Mackenzie & Ludlow Griscom*, no. 10,072; on hill south of St. John's, *M. L. Fernald & K. M. Wiegand*, no. 4570. Quebec: sur les dunes au nord de l'estuaire, Natashquan, *Victorin & Rolland*, no. 18,204; subalpine meadows, 900–1100 m., western slope of Mt. Logan, Matane County, *M. L. Fernald & L. B. Smith*, no. 25,479; Little Metis, *J. Fowler*, July 25, 1906; meadows and swamps southeast of Bic, Rimouski County, *M. L. Fernald & J. F. Collins*, no. 877; alluvium, River Ste. Anne-des-Monts, *J. F. Collins & M. L. Fernald*, August 3–17, 1915; Lac Tremblant, Terrebonne County, *J. R. Churchill*, July 19, 1922; bois humides, Rivière Natiskotek, Anticosti Island, *Victorin & Rolland*, no. 27,837; basin, Ile du Havre-au-Ber, Magdalen Islands, *Victorin & Rolland*, no. 9030. Nova Scotia: summit of Bird Island, Cape Breton, *George E. Nichols*, no. 590; Canso, *J. Fowler*, August 10, 1901, Maine: Allagash River at Two Brooks, Aroostook County, *Emile F. Williams*, July 28, 1900; Slide, west wall of North Basin, Mt. Katahdin, *M. L. Fernald*, July 13, 1900. New Hampshire: Mt. Willard, *E. & C. E. Faxon*, July 20, 1875; Tuckerman's Ravine, Mt. Washington, *G. G. Kennedy*, July 11, 1895; summit of Mt. Moosilauke, *E. F. Williams*, August 3, 1908.

VERMONT: Mt. Mansfield, *W. W. Eggleston*, no. 2475. NORTH CAROLINA: Roan Mt., *F. L. Scribner*, July, 1889. HUDSON BAY: Churchill, lat. 58° 50′, *J. M. Macoun*, no. 79,125. ALBERTA: near Edmonton, *John Macoun*, August, 1872; Devil's Head Lake, Banff, *J. Macoun*, August 3, 1891. MONTANA: Swan Lake, *Mrs. Joseph Clemens*, August 25, 1908. IDAHO: Trinity Lake Region, Elmore County, *J. F. Macbride*, no. 707. WYOMING: Doyle Creek, Big Horn County, *L. N. Goodding*, no. 393; Johnson's Ranch, *Aven Nelson*, no. 3905. COLORADO: Anita Peak, Routt County, *L. N. Goodding*, no. 1752; near Pagosa Peak, *C. F. Baker*, August, 1899; Twin Lakes, *John Wolfe*, no. 1093, 1873 (TYPE, in U. S. National Herbarium). NEW MEXICO: Winsor Creek, Pecos River National Forest, *P. C. Standley*, no. 4748. CALIFORNIA: Angora Peak, Tahoe, 8000 feet, *F. J. Smiley*, no. 312. OREGON: Gibbon, Blue Mts., *Wm. C. Cusick*, no. 3611; wet places near stream, 3 miles above Wallowa Lake, *C. L. Shear*, no. 1797. WASHINGTON: gravelly soil, Cheelum Creek, Kittitas County, *J. S. Cotton*, no. 832; Cascade Mts., *Sandberg & Leiberg*, no. 795. BRITISH COLUMBIA: Moose Lake, *N. Hollister*, no. 20; Kicking Horse Valley, vicinity of Field, *Stewardson Brown*, no. 498; near railroad, Rogers Pass, 4400 feet, *H. Peterson*, no. 468. ALASKA: St. Michaels, *L. M. Turner*, no. 94,258.

This variety is quite distinct from typical *Calamagrostis canadensis* and replaces it to a large extent in Newfoundland, the Gulf of St. Lawrence region, and in the Rocky Mountains. It grades, however, imperceptibly into the typical form on the one hand, and to var. *Langsdorfi* on the other.

Specimens from Eastern Asia (Huigan, Manchuria, *Dorsett & Dorsett*, no. 3740; Heosomui and Aemuro, Yezo, Japan, *K. Miyabe*) are identical with North American forms of this variety, and it is probably general throughout north temperate Eastern Asia.

Var. LANGSDORFI (Link). Inman, RHODORA xxiv. 143 (1922). *Aruñdo Langsdorfi* Link, Enum. Pl. Hort. Berol. i. 74 (1821). *C. Langsdorfii* Trin. Gram. Unifl. 225, t. 4, fig. 10 (1824). *C. scabra* Presl, Rel. Haenk. i. 234 (1828). *Deyeuxia Langsdorfii* Kunth, Rev. Gram. i. 77 (1829). *C. hirtigluma* Steud. Syn. Pl. Gram. 188 (1855)? *C. oregonensis* Buckl. Proc. Acad. Phil. 1862, 92 (1863) in part, acc. to Gray, ibid. 334 (1863). *C. columbiensis* Nutt., Gray l. c. *C. alaskana* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 32 (1898). *C. Trinii* Almq. & Lehb, Svensk. Bot. Tidsskr. v. 374 (1916). —Of circumpolar distribution, in North America extending south to eastern Quebec, the mountains of New England, North Carolina?, Isle Royale, Michigan, and in the mountains to Colorado and California. Although Kearney recorded this variety from Roan Mountain, North Carolina, all specimens from there, seen by the writer, have been var. *robusta* Vasey. The following are typical: GREENLAND:

ca. Neria, 61° 33′ lat. bor. *J. Eugenius*, July 19, 1924; Quagssiarssuk, Igaliko-Fjord, 60° 53′ N. lat., *A. E. Porsild & M. P. Porsild*, August 5, 1925. Labrador: on granitic rock, river delta at head of Nachvak Bay, *R. H. Woodworth*, no. 60; Eclipse Harbor, *H. S. Forbes*, no. 11. Newfoundland: rocky meadows and brook bottoms, upper Deer Pond Brook, Highlands of St. John, *M. L. Fernald & Bayard Long*, no. 27,488; dry meadow, Bay St. George, *C. D. Howe & W. F. Lang*, no. 1014. Quebec: Blanc Sablon, *Ludlow Griscom*, no. 11; vielle prairie, Pointe-aux-Esquimaux, *Victorin & Rolland*, no. 18,209; rocky shore, Bonaventure Island, *Fernald & Collins*, no. 884; à la limite des arbres, sur les schistes hornblendiques, alt. 1300 m., Mt. Albert, *Victorin & Rolland*, no. 17,799. New Hampshire: five-mile post, Mt. Washington, *E. & C. E. Faxon*, July 9, 1895; Mt. Willey, *Faxon*, August 25, 1877; Echo Lake, Mt. Lafayette, *E. & C. E. Faxon*, September 14, 1890. Vermont: Smuggler's Notch, *E. & C. E. Faxon*, August 10, 1877. Ontario: near Silver Islet, *Henry Elman*, no. 64. Michigan: Isle Royale, Lake Superior, *T. C. Porter*, August 2, 1865. Colorado: wet grounds, 8000–10,000 ft. alt., Golden City, *E. L. Greene*, no. 437. California: wet places, Yosemite Valley, *H. N. Bolander*, no. 6088. Oregon: marsh, Pamalia Lake, foot of Mt. Jefferson, *Nelson*, no. 2784. Washington: base of Totoish Mountains, alt. 5000 ft., *O. D. Allen*, no. 176. British Columbia: Huchayak, *McKay*, 1882; Nootka, Vancouver Island, *Scouler*. Yukon Territory: Lake Kluane to Don Jek River, *A. Müller*, August 11–27, 1920. Alaska: False Pass, Unimak Island, *O. J. Murie*, August 7, 1925; Atkha Island, *L. M. Turner*, no. 1188; Ankon River, Yakutat Bay, *Funston*, no. 131; LeConte Bay, *Walker*, no. 873; St. Paul Island, Bering Sea, *Macoun*, no. 94,257.

Var. *Langsdorfi* in the arctic regions is very distinct from typical *Calamagrostis canadensis*, but there are so many intermediates between it and var. *robusta* where their ranges overlap, that it seems inadvisable to maintain it as a species. It is, however, as Dr. Eric Hultén suggested (Flora Kamtchatka, i. 103 (1927)), the central "link in the chain of closely allied forms together constituting a circumpolar type," and it is probable that the more southern forms have been evolved from it. Whether, as he further suggests, *C. villosa* Mutel and *C. purpurea* Trin., both of Eurasia, are merely varietal offshoots from this type, the writer has not seen enough critical material to judge. Certainly the European specimens of *C. villosa* seem very distinct from any American form, in their very narrow, long-acuminate glumes, long callus-hairs, and leaves long-pilose on the upper surface. If *C. villosa* and *C. Langsdorfi* were varieties of the same species, the whole set of forms, including *C. canadensis* and varieties, would have to be treated as varieties of *C. villosa*, that being the earliest name. How-

ever, in the opinion of the writer, this is not the case. He has not seen any authentic material of *C. purpurea* from Eastern Asia, where it was originally collected, but Scandinavian material (which Dr. Hultén suggests may be a hybrid) seems quite distinct from *C. Langsdorfi*. However, the final decision on these points will have to be left to European systematists.

Calamagrostis lactea Beal, Grasses N. A. ii. 346 (1896) (*C. Langsdorfi* var. *lactea* Kearney) is a peculiar form with the expanded panicle, the thin, hyaline lemma, and the short palea of this variety, but with the callus-hairs only two-thirds the length of the lemma, and the awn geniculate and twisted at the base. It is probably a hybrid between *C. canadensis* var. *Langsdorfi* and *C. nutkaensis* Presl.

Var. **arcta**, n. var., culmis erectis 4–6 dm. altis; foliis caulinis brevibus 7–12 cm. longis involutis scabris, ligulis suis 1.5–2.5 mm. longis; panicula 10–15 cm. longa contracta longissimis ramis suis 4–5 cm. longis; glumis in carina scabris, alibi minute pubescentibus vel glabris; lemmate 3.6–4.2 cm. longo, arista vix infra medium inserta recta, pilis lemma aequantibus vel excedentibus, nonnumquam paulo brevioribus; palea 2.8–3 mm. longa; processu 0.7–0.8 mm. longo barbato; antheris 1.4 mm. longis.

Culms erect, 4–6 dm. tall: cauline leaves short, 7–12 cm. long, involute, scabrous; their ligules 1.5–2.5 mm. long: spikelets 4–5 mm. long: glumes scabrous on the keel, elsewhere minutely pubescent or glabrous: lemma 3.6–4.2 mm. long: awn inserted just below the middle, straight: callus-hairs equalling or exceeding the lemma, sometimes a little shorter: palea 2.8–3 mm. long: prolongation of the rhachilla 0.7–0.8 mm. long, bearded: anthers 1.4 mm. long.—Greenland and Labrador. Type specimen in Gray Herbarium, collected on granitic cliffs at 150–600 m. at the Head of Nachvak Bay, Torngat Region, Labrador, *R. H. Woodworth*, no. 62, distributed as *C. hyperborea* Lange. Specimens examined: Greenland: Arfersiorfik Fjord, west Greenland, lat. 67° 53′ N., long. 50° W., *Porsild*, July 7, 1924. Labrador: Nachvak Bay, *Woodworth*, no. 62; north arm of Saglek Bay, *Woodworth*, no. 63 (as *C. hyperborea*).

A very distinct variety, resembling *Calamagrostis inexpansa* in its narrow, contracted panicle, and *C. neglecta* in its short ligules, but with the spikelets of *C. canadensis* var. *Langsdorfi*. The Greenland specimen differs in its shorter callus-hairs. It may be identical with *C. lapponica* var. *groenlandica* Lange (Consp. Fl. Groen. ii. 296 [1897]), but *C. lapponica* differs in its thicker, opaque lemma and curved or slightly geniculate awn.

Var. **pallida** (Vasey & Scribn.), n. comb. *Calamagrostis pallida* Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 79 (1892).

C. blanda Beal, Grasses N. Am. ii. 349 (1896).—Wyoming and Montana to Washington, north to Alaska. Specimens examined: Wyoming: Yellowstone Park, *C. C. Parry*, no. 300; Lewis River to West Thumb, Yellowstone Park, *E. D. Merrill*, no. 151. Washington: along streams, Blue Mts., Columbia County, *Robert M. Horner*, no. R495B536; Washington Territory, *W. N. Suksdorf*, 1884. Alaska: Lake Iliamna Region, *M. W. Gorman*, no. 220.

Since the name *pallida* was used before Vasey & Scribner only by C. Mueller (Walp. Ann. vi. 986) for a variety or subspecies of *C. Halleriana* DC., it seems best to retain it for this American form.

While appearing quite distinct from *Calamagrostis canadensis*, *C. pallida* is separated by no reliable characters. Shade forms of *C. canadensis* exactly simulate *C. pallida* in shape and texture of glumes, while the flexuousness of the panicle-branches, a character used by Kearney to separate the two species, is very variable in both forms. The only definite character separating the two is the position of the insertion of the awn, and since aberrant forms with all the characters of *C. canadensis* but with the awn inserted near the tip of the lemma have been found (Alexis, Ohio, *H. A. Young*, June 28, 1885) it has seemed best to relegate *C. pallida* to a variety of *C. canadensis*.

2. C. Scribneri Beal, Grasses N. Am. ii. 343 (1896). *Deyeuxia dubia* Scribn. Bot. Gaz. xi. 174 (1886), not *Calamagrostis dubia* Bunge, Lehm. Rel. 348 (1847). *C. dubia* Scribn. in Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 80 (1892). *C. canadensis dubia* Vasey l. c. *C. Langsdorfi* var. *Scribneri* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912).—Montana and Colorado to Oregon and Washington. Specimens examined: Wyoming: Slough Creek, Yellowstone Park, *Frank Tweedy*, no. 385. (type in U. S. National Herbarium). Idaho: Collins, *C. V. Piper*, no. 2815. Colorado: near Pagosa Peak, alt. 10,000 ft., *Th. Holm*, August 20, 1896. Oregon: granitic subalpine meadows, Wallowa Mts., 1660 m. alt., *Cusick*, no. 3120.

Quite distinct from all varieties of *Calamagrostis canadensis* in its bearded sheaths, short callus-hairs and longer palea. Specimens from eastern Quebec referred to this species are all forms with narrow panicles of *C. canadensis*.

Var. **imberbis**, n. nom. *C. anomala* Suksd. in Allg. Bot. Zeit. xii. 43 (1906), not Steud. in Lechl. Berb. Am. Aust. 56 (1857). Sheaths glabrous at the summit: palea shorter, ⅔ as long as the lemma, sometimes with a weak awn at the tip: otherwise as in the preceding.—Alberta and Wyoming to Washington. Specimens examined: Alberta: Kicking Horse Lake, *Macoun*, August 16, 1890. Wyoming: Woods Creek, *Nelson*, no. 3954. Washington: dry, loose soil, Chiquash Mts., *Suksdorf*, no. 2824 (type of *C. anomala* Suksd.).

Approaching *Calamagrostis canadensis* var. *robusta*, but differing in its narrower panicle with erect branches, short, unequal callus-hairs, and acutely toothed lemma.

3. C. CINNOIDES (Muhl.) Bart. Fl. Phila. i. 45 (1818). *Agrostis glauca* Muhl. Descr. Gram. 76 (1817), not *Arundo glauca* Bieb. *Arundo cinnoides* Muhl. Descr. Gram. 187 (1817). *C. canadensis* Nutt. Gen. i. 46 (1818) as to description, not *Arundo canadensis* Michx. *Arundo stricta* Spreng. Neu. Entdeck. i. 247 (1820) not Timm. *Phalaris arundinacea* Spreng. l. c. *P. americana* Spreng. l. c. *C. Langsdorfii Marylandica* Trin. Gram. Unifl. 225 (1824). *C. glauca* Trin. ibid. 228. *Arundo coarctata* Torr. Fl. U. S. 94 (1824). *A. canadensis* Nutt., Steud. Nom. ed. 1, 144 (1840). *C. Nuttalliana* Steud. ibid. 251. *C. coarctata* Torr. in Gray, Gram. et Cyp. i. no. 19 (1834). *Deyeuxia Nuttalliana* Vasey, Descr. Cat. Grasses U. S. 51 (1885). - Nova Scotia and Maine to Ohio, south to Georgia and Alabama. The following are typical: NOVA SCOTIA: Halifax, *J. R. Lunt*, July 18, 1912. MAINE: South Berwick, *J. C. Parlin*, September 12, 1896. NEW HAMPSHIRE: Hampton Beach, *A. A. Eaton*. MASSACHUSETTS: Purgatory, Dedham, *C. E. Faxon;* Barnstable, *J. M. Greenman*, no. 374. CONNECTICUT: Portland, Middlesex County, *Frances Wilson*, no. 70; Southington, *C. H. Bissell*, no. 743. NEW YORK: north side, Staten Island, *A. Gershoy*, no. 767. NEW JERSEY: Egg Harbor, *C. H. Bissell*, September 11, 1915; Lindenwold, Camden County, *J. M. Fogg, Jr.*, no. 608. PENNSYLVANIA: Red Rock Barren, Bushkill, Pike County, *E. B. Bartram*, August 3, 1918. DELAWARE: Pencader, *Edward Tatnall*. MARYLAND: near Clinton, *Th. Holm*, August 30, 1921. DISTRICT OF COLUMBIA: Tacoma, *T. H. Kearney, Jr.*, August, 1895. SOUTH CAROLINA: Caesar's Head, *J. D. Smith*, August, 1881. GEORGIA: Woodbury, Meriwether County, *R. M. Harper*, no. 1256.

4. C. SCOPULORUM M. E. Jones, Proc. Calif. Acad. Sci. ser. 2, v. 722 (1895). *C. scopulorum* var. *lucidula* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 33 (1898).—Utah. Specimens examined: UTAH: Altah, *M. E. Jones*, no. 1145 (TYPE of *C. scopulorum* var. *lucidula* Kearney); Armstrong and White Canyons, *Rydberg & Garrett*, no. 9512 (U. S.).

Var. **Bakeri**, n. var., arista inter dentes lemmatis inserta.

Awn inserted between the teeth of the lemma.—Near Pagosa Peak, at 9,000 feet, southern COLORADO, *C. F. Baker*, no. 162, August, 1899 (TYPE, in Gray Herbarium).

5. C. LUCIDA Scribn. Circ. U. S. Dept. Agric. Div. Agrost. xxx. 8 (1901). *Deyeuxia neglecta* var. *gracilis* Scribn. Bot. Gaz. lx. 175 (1886). *C. laxiflora* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 34 (1898), not Philippi, Anal. Univ. Chile (Pl. Nuev. Chilen.) xciv. 18 (1896).—Meadows, East Fork, YELLOWSTONE PARK, *Tweedy*, no. 582.

A peculiar form, known only from the type specimens. It has the short callus-hairs, opaque lemma, and glumes with the texture of those of *Calamagrostis neglecta*, but its foliage is rougher, the ligules longer, and the branches of the panicle more flexuous and less scabrous than in that species. It is probably a hybrid between *C. canadensis* and *C. neglecta*.

6. C. INEXPANSA A. Gray, Gram. et Cyp. i. no. 20 (1834). A very variable species. The following are well-marked varieties:

a. Spikelets 4–5.5 mm. long: lemma 3.5–4 mm. long: palea 2.7–3.2 mm. long....*b.*
  b. Culms solitary: panicle 15–18 cm. long, loosely flowered; its longest branches 5–6 cm. long; its first internode 4 cm. long.....Var. *typica.*
  b. Culms mostly more or less caespitose: panicle 8–14 cm. long, densely flowered; the longest branches 2–4 cm. long; its first internode 1–2.5 mm. long.....Var. *robusta.*
a. Spikelets 3–4.5 mm. long: lemma 2.5–3.5 mm. long: palea 1.7–2.6 mm. long....*c.*
  c. Sheaths bearded at the summit: awn very short, inserted above the middle of the lemma or wanting.....Var. *barbulata.*
  c. Sheaths glabrous at the summit: awn present, inserted below the middle of the lemma....*d.*
    d. Panicle compactly flowered; its branches rigid, appressed, forked and spikelet-bearing nearly to the base: glumes thick and opaque, usually purple-tinged..Var. *brevior.*
    d. Panicle more loosely flowered; its branches erect or slightly spreading in anthesis, forked and spikelet-bearing from the middle or above: glumes thin except near the keel, green, rarely purple-tinged.....Var. *novae-angliae.*

Var. **typica**. *C. inexpansa* Gray, l. c.; Torr. Fl. N. Y. ii. 445, t. 152 (1843). *C. confinis* Gray, Man. ed. 2, 547 (1856), not Nutt. *C. neglecta* var. *inexpansa* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912). —Central New York and probably scattered locally throughout the Central States, and north to the Athabasca River. The writer has seen only the following: NEW YORK: Penn Yan, Yates County, *H. P. Sartwell*, 1833 (TYPE). ALBERTA: Athabasca Landing, *Hitchcock*, no. 11,429 (U. S.).

Typical *Calamagrostis inexpansa* is apparently a very local plant, differing from all other varieties in its elongate, loosely flowered panicle. It is probably a luxuriant southern extreme, found in good soil in sheltered places, of the more northern and generally distributed var. *robusta*. Forms of var. *brevior* approach it in length of panicle, but the panicle of that variety is always more densely flowered and the spikelets shorter.

Var. **robusta** (Vasey), n. comb. *C. stricta* var. *robusta* Vasey in Wheeler Rep. vi. 285 (1878). *C. hyperborea* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39 (1898) in part, not Lange.—New-

foundland and eastern Quebec; the Rocky Mountains south to Colorado; and in the Coast Ranges from Oregon and Washington north to Alaska. The following are typical: NEWFOUNDLAND: calcareous rocks and talus, entrance to Port Saunders Harbor, Ingornachoix Bay, *Fernald & Wiegand*, no. 2555; in gravel, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2561; serpentine gravel along Blomidon Brook, Bay of Islands, *Fernald & Wiegand* no. 2560; in limestone barrens, upper slopes, alt. 200–300 m., Table Mountain, Port à Port Bay, *Fernald & Wiegand*, no. 2558. QUEBEC: sur les gneiss laurentiens de la Pointe à la Marmite, Sept-Iles, *Victorin & Rolland*, no. 18,198; rivages calcaires, Ile à la Vache Marine, Mingan Islands, *Victorin & Rolland*, no. 20,522; dry talus of slaty cliffs, northern face of Mt. St. Pierre, at mouth of Riviere à Pierre, Gaspé County, *Fernald & Smith*, no. 25,480; border of Lac Chicoté, Table-topped Mountain, *Fernald*, no. 360; sur les cailloutis du plateau, Sand-Top, Anticosti, *Victorin & Rolland*, no. 27,835. ALBERTA: Cataract Creek, near Pinto Lake, *Stewardson Brown*, no. 1484 (as *C. Suksdorfi*). MONTANA: Swan Lake, *Griffiths & Lange*, no. 119 (as *C. montanensis*). COLORADO: Twin Lakes, *John Wolfe*, 1873 (TYPE in U. S. National Herbarium). OREGON: moist meadows, Union County, *W. C. Cusick*, 1879. WASHINGTON: low ground near Spangle, Spokane County, *Suksdorf*, no. 1100. BRITISH COLUMBIA: Vancouver Island, *Rosendahl & Brandegee*, no. 77 (U. S.); British Columbia, *H. L. Bolley*, 1889 (U. S.). ALASKA: Beardslee Island, Glacier Bay, *Anderson*, no. 1185 (U. S.); Yukon River, *Dawson*, no. 97 (U. S.); lake margin, Dutch Harbor, Unalaska, *E. C. Van Dyke*, no. 218.

There is no sharp specific line separating typical *Calamagrostis inexpansa* from the American forms identified by Dr. Kearney with *C. hyperborea* Lange, of Greenland. The stoloniferous habit is general throughout the genus, and whether the culms are solitary or caespitose depends chiefly on the type of soil in which they are growing. The panicle of typical *C. inexpansa* is longer and more loosely flowered, but many intermediates occur, particularly between the typical form and var. *brevior*. It seems wisest, therefore, to include all of these forms under *C. inexpansa*, except *C. hyperborea* of Greenland, which is specifically distinct.

Var. *robusta* is the most northern in distribution of these forms. It is the common form in Newfoundland, but is more local in Quebec, and is apparently much less common in the Rocky Mountains than the forms with smaller spikelets. It is very variable in stature, habit of growth, and in the shape and color of its glumes, but on the whole constitutes a well-marked trend.

Var. BARBULATA Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 37 (1898). Known only from the TYPE specimen: Mason County, WASHINGTON, *Piper*, no. 947.

Var. **brevior** (Vasey), n. comb. *Calamagrostis stricta* var. *brevior* Vasey in Wheeler Rep. vi. 285 (1878). *C. stricta* A. Gray, Proc. Am. Acad. vi. 79 (1866), not Timm. *Deyeuxia neglecta* var. *americana* Vasey in Macoun, Cat. Can. Pl. iv. 206 (1888). *D. neglecta* var. *robusta* Vasey l. c. *C. robusta* Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. iii. 82 (1892). *C. americana* Scribn. Bull. U. S. Dept. Agric. Div. Agrost. xi. 40 (1897). *C. hyperborea elongata* Kearney, ibid. xi. 40 (1898). *C. hyperborea stenodes* Kearney, ibid. 39, in part. *C. hyperborea americana* Kearney, ibid. 40. *C. elongata* Rydb. Rocky Mt. Fl. 58 (1917). *C. wyomingensis* Gandog. Bull. Soc. Bot. France, lxvi, sér. xix. 299 (1919).—Newfoundland and eastern Quebec to northern Vermont and central New York, west to British Columbia, south in the mountains to New Mexico, Arizona, and California. The following are typical: Newfoundland: Green Gardens, Cape St. George, *K. K. Mackenzie & Ludlow Griscom*, no. 11,117; springy places, north bank of river below the falls, Grand Falls, Exploits River, *Fernald & Wiegand*, no. 4583. Quebec: wet shelf at 400 feet, Grande Coupe, Percé, Gaspé County, *Collins, Fernald & Pease*, August 19, 1904; limestone-conglomerate cliffs and ledges, Cap au Massacre, Bic, *Collins & Fernald*, July 16, 1904; alluvions près de l'embouchure, Rivière a Jupiter, Anticosti Island, *Victorin & Rolland*, no. 24,377. New Hampshire: summit of Mt. Cannon, Franconia, *William Boott*, July 8, 1870. Vermont: base of Willoughby Cliff, *E. & C. E. Faxon*, July 26, 1886. New York: shore of Lowery's Pond, Junius, *K. M. Wiegand & R. Jones*, August 3, 1917. Ontario: Mungo Park Point, Nipigon Lake, *H. E. Pulling*, 1912. Indiana: railroad track, Clarke, *L. M. Umbach*, June 27, 1896. Michigan: sphagnum bog, Mud Lake, Cheboygan County, *J. H. Ehlers*, no. 563; Isle Royale, *W. S. Cooper*, no. 192. Wisconsin: University Bay, Madison, *J. R. Heddle*, no. 2T195. Minnesota: Iowa-Minnesota line, Elmore, *L. H. Pammel*, no. 915. North Dakota: Leeds, *J. Lunell*, no. 13. South Dakota: Brookings, *J. J. Thornber*, July 1, 1893. Nebraska: on Dismal River, south of Thedford, Thomas County, *P. A. Rydberg*, June 27, 1893. Saskatchewan: Regina, *J. Fowler*, July 27, 1903. Alberta: road and prairie, Craigmyle District, *A. H. Brinkman*, no. 727; near Jasper, *J. M. Macoun*, no. 98,159; damp ground, Castle Hill District, Rosedale, *M. E. Moodie*, no. 1131. Montana: wet meadow, Sheep Creek, *P. A. Rydberg*, no. 3309; Columbia Falls, *R. S. Williams*, September 25, 1893. Idaho: open soil near the river, St. Anthony, *E. D. Merrill & W. N. Wilcox*, no. 153. Wyoming: bars of Buffalo River at Government Bridge, Teton Forest Reserve, *Merrill & Wilcox*, no. 403; Sheridan, *Elias Nelson*, no. 301. Colorado: Gunnison, *C. F. Baker*, no. 579; Fort Garland, *Vasey*, 1884. Utah: springy places, Crossman Valley, east of Lookout Mountains, *H. Engelmann*, July 20, 1859. Nevada: West Humboldt Mountains, *S. Watson*, no. 1290. Arizona: Willow Spring, *E. Palmer*, no. 616. California: Nellie Lake, Fresno

County, *F. J. Smiley*, no. 611. OREGON: one mile southeast of Keno, Klamath County, *M. E. Peck*, no. 9402. WASHINGTON: Douglas County, *Sandberg & Leiberg*, no. 525. BRITISH COLUMBIA: summit of Selkirk Mountains, altitude 4500 feet, *John Macoun*, August 2, 1890.

This is the common form throughout the Great Plains and the Cordilleran Region. It is very variable in the length and compactness of its panicle, the shape of its glumes, and in the general habit of its leaves and culms, but no definite segregates can be made. Dr. Kearney separated forms with elongate panicles and more acuminate glumes as *Calamagrostis hyperborea elongata*, but the type specimen which he cites (Dismal River, Plummer County, Nebraska, *Rydberg*, no. 1494) is hardly separable from the typical form of var. *brevior*, and the differences on which the variety is based are very inconstant, particularly the shape of the glumes, which appears to change as the spikelet matures.

A form from Bic, Quebec (*Fernald & Collins*, no. 880), has the spikelets of this variety, but the smooth foliage and short ligules of *Calamagrostis neglecta*. It may be a hybrid between these two.

Calamagrostis hyperborea stenodes Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39, is an aggregate of forms with short, densely flowered panicles, some of which may be referred to this variety, and some may be hybrids between it and *C. neglecta*. The type specimen is clearly *C. neglecta*.

Var. **novae-angliae**, n. var., culmis solitariis erectis 11–15 dm. altis; foliis caulinis planis scabris ligulis suis 4–7 mm. longis; panicula 12–16 cm. longa angusta, ramis erectis vel ad anthesin paulo patentibus, longioribus 2–5 cm. longis, infra rectis vel paulo flexuosis, ramosis et spiculas ferentibus ad vel supra medium; spiculis 3.5–4 mm. longis; glumis acuminatis valde carinatis scabris ad apicem pallidis fuscescentibus, alibi viridibus albescentibus et translucentibus: lemmate paleaque precedenti similibus.

Culms solitary, erect, 11–15 dm. tall: cauline leaves flat, scabrous, their ligules 4–7 mm. long: panicle 12–16 cm. long, narrow; its branches erect, or somewhat spreading in anthesis; the longer 2–5 cm. long, straight below or somewhat flexuous, branched and spikelet-bearing from the middle or above: spikelets 3.5–4 mm. long: glumes acuminate, strongly keeled, scabrous, chartaceous at the tip, elsewhere pale green and faintly translucent: lemma and palea as in the preceding.—Damp woods and wet, shaded cliffs, northern New England. Specimens examined: MAINE: woods, trail from Northeast Harbor to Jordan Pond, Mt. Desert Island, *E. F. Williams & E. L. Rand*, July 19, 1899 (TYPE in Gray Herb.); Jordan Mt., Mt. Desert Island, *E. L. Rand*, July 19, 1897 (N. E.). NEW HAMPSHIRE: Crawford

Notch, Hart's Location, *A. S. Pease*, no. 16,749 (N. E.). Vermont: high ledges, Willoughby Mt., Willoughby, *Walter Deane*, July 19, 1885.

A form preferring shady, sheltered places, apparently not calcicolous as are the other varieties of this species, and possibly more abundant in New England and the adjacent territory. The Mt. Desert material, collected in several different localities on the Island, is almost identical with that from Crawford Notch, and forms with it a well-marked variety with almost enough characters to make it a distinct species, but the specimens from Willoughby, growing together with var. *brevior*, show transitions to that variety. The glumes are considerably thinner than those of the other varieties of *Calamagrostis inexpansa*, and somewhat resemble those of *C. neglecta*, but they are paler, greener, and more scabrous, while the broad, scabrous leaves and long ligules distinguish it immediately from that species.

7. C. crassiglumis Thurb. in S. Wats. Bot. Calif. ii. 281 (1880). *Deyeuxia crassiglumis* Vasey, Descr. Cat. Grasses U. S. 50 (1885). *C. neglecta* var. *crassiglumis* Beal, Grasses N. Am. ii. 353 (1896).—Northern California to Alaska, near the coast. Specimens examined: California: swamps, Mendocino County, *Bolander*, no. 4766 (type). Washington: Whatcom Lake, Whatcom County, *Suksdorf*, no. 1024. British Columbia: pebbly beaches, Cowichan Lake, Vancouver Island, *C. O. Rosendahl*, no. 1866; sandy shores, Lake Karmutzen, Vancouver Island, *Dawson*, August 6, 1885. Alaska: Amaknak Island, Unalascha, *M. W. Harrington*, October 20, 1871; without definite locality, *A. Kellogg*, no. 154.

A very well marked species. A form from Humboldt County, California, (*Kellogg & Harford*, no. 1090) has the thick glumes of this species, but has much larger spikelets, 6 mm. long, long ligules, and rough foliage, while the anthers are 2.6 mm. long, larger than in any species of this subsection. It may be a hybrid between *Calamagrostis crassiglumis* and *C. nutkaensis* Presl.

8. C. hyberborea Lange, Fl. Dan. xvii. 50, t. 2942 (1880); Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39 (1898), in part. *C. neglecta* var. *hyperborea* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912), in part.—Greenland. Specimens examined: Neria, 61° 33′ lat. bor., *J. Eugenius*, July 30, 1924, and July 30, 1925; Holsteinborg, *Th. M. Fries*, August 1, 1871.

Distinguished from all varieties of *Calamagrostis inexpansa* by its leaves, smooth on the lower, scabrous only on the tip and the upper surface; short ligules; and very narrow, acuminate glumes which are frequently hyaline on the tip and the margins. The original descrip-

tion says "foliis planis, scabris," but it is probable that this referred to the upper surface only.

9. C. LABRADORICA Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 38 (1898).—Southern Labrador, south along the northern shore of the Gulf of St. Lawrence to Anticosti Island. Specimens examined: QUEBEC: Bonne Espérance, *J. A. Allen*, no. 18 (TYPE U. S.); Bradore, Saguenay County, *Fernald & Wiegand*, no. 2551; Vielle Romaine, Archipel Ouapitagone, *H. St. John*, no. 90,125 (distributed as *C. hyperborea*); Ilêts de la Baie à Jean, *Victorin & Rolland*, no. 18,197; Natashquan, *Fernald & Long*, no. 27,496 (as *C. neglecta* var. *borealis*); sur les gneiss laurentiens du rivage, Magpie, *Victorin & Rolland*, nos. 18,242 and 18,541 (as *C. neglecta* var. *borealis*); Pointe Sud-Ouest, Anticosti, *Victorin & Rolland*, nos. 24,383 and 27,482 (as *C. neglecta*). The specimen from Fox Harbor, Labrador, (*J. A. Allen*, 1882) cited by Kearney has not been seen by the writer.

Intermediate between *Calamagrostis inexpansa* var. *robusta* and *C. neglecta*. It has in general the spikelet-characters of the former, but the glumes are more lustrous and less scabrous. The habit, foliage, and ligules resemble *C. neglecta*. The type specimen, and others from the northern part of the range of the species have a much interrupted panicle with very short branches, but forms from farther south with the same habit and spikelet-characters have a more compact, somewhat shorter panicle.

11. C. NEGLECTA (Ehrh.) Gaertn., Meyer & Scherb. Fl. Wetterau, 94 (1799). Very variable. The following are sufficiently marked to be classed as varieties.

a. Spikelets 3–5 mm. long: glumes sharply acute or acuminate . . . . . *b*.
  b. Culms 3–10 dm. high: panicle 5–15 cm. long: callus-hairs ½–¾ the length of the lemma: awn inserted ¼–⅓ of the way up the lemma . . . . . *C. neglecta* (typical).
  b. Culms 1–4 dm. high: panicle 2–5 cm. long: callus-hairs ¼–½ the length of the lemma: awn inserted ⅓–½ the way up the lemma . . . . . Var. *borealis*.
a. Spikelets 2–2.6 mm. long: glumes obtuse or merely acute . . . Var. *micrantha*.

C. NEGLECTA (Ehrh.) Gaertn., Meyer & Scherb. l. c., as to name-bringing synonymy. *Arundo neglecta* Ehrh. Beitr. vi. 84, 137 (1791). *A. stricta* Timm. in Siemss. Meckl. Mag. ii. 235; ex Schrad. Fl. Germ. 215 (1806). *C. stricta* Koel. Descr. Gram. 105 (1802). *Deyeuxia neglecta* Kunth, Rev. Gram. i. 76 (1835). *C. coarctata* Hook. Fl. Bor.-Am. ii. 240 (1839). *C. lapponica* A. Gray, Proc. Am. Acad. vi. 78 (1866) in part. *Deyeuxia neglecta brevifolia* Vasey in Macoun, Cat. Can. Pl. iv. 206 (1888). *C. neglecta Wrightii* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 36 (1898). *C. californica* Kearney, ibid. 37. *C. hyperborea stenodes* Kearney, ibid. 29, in part.—Northern Eurasia, and in America from Greenland and Labrador to Alaska, south to

Nova Scotia, New Brunswick, northern Maine, Wisconsin, Colorado and California. The following are typical: Greenland: Quagssiarssuk, Igaliko-Fjord, 60° 53′ N., *A. E. Porsild & M. P. Porsild,* August 5, 1925 (as *C. hyperborea* Lange). Labrador: on sandy bank of White Bear River, Sandwich Bay, *R. H. Woodworth,* no. 61. Newfoundland: gravelly and turfy strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss,* no. 27,491; boggy barren south of Ship Cove, Sacred Bay, *Fernald, Wiegand & Long,* no. 27,492. Quebec: swales along Blanc Sablon River, Straits of Belle Isle, *Fernald, Wiegand & Long,* no. 27,495; tourbière humide, Ile à la Chasse, Mingan Islands, *Victorin & Rolland,* no. 24,381; sur les platieres, Rivière York, Gaspé County, *Victorin et al.,* no. 17,802; margin of cold brook, mouth of Bonaventure River, Bonaventure County, *Williams & Fernald,* July 31, 1902; dans la grande prairie saumâtre, Lac Salé, Anticosti, *Victorin & Rolland,* no. 27,840; bogs and ponds between East Cape and East Point, Coffin Island, Magdalen Islands, *Fernald et al.,* no. 6860. Prince Edward Island: brackish marsh, Green's Shore, Summerside, *Fernald & St. John,* no. 6858. New Brunswick: wet, marshy land, Shediac Cape, *F. T. Hubbard,* no. 705; river gravels, St. John River, Woodstock, Carleton County, *Fernald & Long,* no. 12,635. Nova Scotia: springy swales south of Amherst, Cumberland County, *Fernald,* no. 19,430. Maine: strand of Aroostook River, Fort Fairfield, Aroostook County, *R. W. Woodward & C. H. Bissell,* July 11, 1914. Wisconsin: Menekaunee, *J. H. Schuette,* June 26, 1892 Minnesota: Middle Lake, *C. A. Ballard,* June 1892. Saskatchewan: marshes near Boulder Lake, *John Macoun & Wm. Heriot,* no. 77,147 (U. S.). Alberta: swamp, Banff, *A. S. Hitchcock,* no. 11,476 (U. S.) (as *C. inexpansa*). Montana: borders of streams, *F. L. Scribner,* July, 1883 (U. S.). Idaho: Montpelier, *T. A. Williams,* no. 2521. Wyoming: Bull Camp, Crazy Woman's Creek, 7500–8000 ft., *T. A. Williams,* no. 2768 (as *C. hyperborea*); Black Rock Springs, Sweetwater County, *Aven Nelson,* no. 3717 (as *C. americana*). Colorado: Rocky Mountains, lat. 39°–41°, *Hall & Harbour,* no. 649. California: Sierra County, *J. G. Lemmon,* no. 444 (type of *C. californica* Kearney). Oregon: Big Meadow, Des Chutes River, *J. R. Leiberg,* no. 522. Washington: Marshall Junction, *C. V. Piper,* no. 2254. British Columbia: Terrace, Skiva River, *J. K. Henry,* no. 17 (U. S.). Yukon Territory: Bear Creek, near Lake Desert d'Asch, *Adolf Mueller,* August 6, 1920. Alaska: Glacier Bay, *Walker,* no. 826.

Variable in height, length and breadth of leaves, and size of panicle. It is sometimes too close to the varieties with small spikelets of *Calamagrostis inexpansa,* but can usually be distinguished by its leaves which are smooth on the lower surface, its short ligules, and its thinner, more translucent glumes, although intermediates occasionally occur in all these characters. The western forms have generally

rougher foliage, although agreeing with true *C. neglecta* in all other characteristics.

Var. BOREALIS (Laestad.) Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 35 (1898). *Arundo groenlandica* Schrank, Regensb. Denkschr. ii. 8 (1818). *C. groenlandica* Kunth, Rev. Gram. i. 79 (1829). *C. borealis* Laest. Bidr. Vaextl. Torn. Lappm. Ups. 44 (1860). *C. stricta* var. *borealis* Hartm. Skand. Flor. ed. 11, 517 (1879). *Deyeuxia vancouverensis*, Vasey, Bull. Torr. Club. xv. 48 (1888). *Deyeuxia borealis* Macoun, Cat. Can. Pl. iv. 207 (1888).—Arctic regions, south in North America to Labrador, Newfoundland and James Bay. The following are typical: GREENLAND: Atanikerdluk, lat. 70° 2′ *A. E. Porsild*, August 10, 1921; Millenfjordens Bund, *A. E. Porsild*, August 11, 1923; Disco, *M. P. Porsild*, August 16, 1902. LABRADOR: Bowdoin Harbor, *C. S. Sewall*, no. 133; Nain, *Sewall*, no. 96; Anatolak, *Sewall*, no. 429. NEWFOUNDLAND: Burnt Cape, Pistolet Bay, *Fernald & Long*, no. 27,490; Capstan Point, Flower Cove, Straits of Belle Isle, *Fernald, Long & Dunbar*, no. 26,270; Grand Lake, *Waghorne*, no. 61.

Except for its small size and short panicle, the characters separating this variety from the typical form are very unreliable, although it represents a sufficiently well-marked tendency to be separated as a variety. Schrank's *Arundo groenlandica* is undoubtedly the same, but it is not, as Steudel suggests, the same as Steudel's *Calamagrostis hirtigluma*, which he describes as a larger plant, with flat leaves, a panicle 3–4 inches (7–10 cm.) long, and which is very likely *C. canadensis* var. *Langsdorfi*, although his description is wholly inadequate.

Var. **micrantha** (Kearney), n. comb. *C. micrantha* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 36 (1898). *C. micrantha* var. *sierrae* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912)?—Wisconsin and Saskatchewan locally west to California, north to Yukon Territory. Specimens examined: WISCONSIN: Madison, *T. J. Hale*, 1860. NORTH DAKOTA: Pleasant Lake, Pierce County, *J. Lunell*, no. 22. ALBERTA: Athabasca Landing, *Hitchcock*, no. 11,431 (U. S.). COLORADO: Steamboat Spa, *Shear & Bessey*, no. 1351. OREGON: Farwell Bend, Crook County, *J. B. Leiberg*, no. 463; Devil's Lake, *A. S. Hitchcock*, no. 23,490 (U. S.). YUKON TERRITORY: along Yukon River, Whitehorse, *Hitchcock*, no. 2943 (U. S.).

Calamagrostis micrantha Kearney does not seem specifically distinct from *C. neglecta*, as intermediates are found both in size and shape of the glumes and in the breadth of the panicle. The writer has not seen material of var. *sierrae* M. E. Jones, and it may be varietally distinct, although the characters given are not reliable ones. The specimen from Farwell Bend, Oregon (*J. B. Leiberg* 463) has longer panicle-

branches, and a very short or obsolete awn, and may correspond with this variety, but the writer does not feel justified in separating it without seeing more material.

C. neglecta var. *candidula* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 35, with pale scabrous leaves, long ligules, pale glumes, a distinctly bent, though not twisted awn, and the lemma nearly equalling the palea, clearly does not belong to this species, and is probably an aberrant form of *C. montanensis* Scribn.

11. C. LAPPONICA (Wahlenb.) Hartm. Skand. Fl. ed. 1, 46 (1820). *Arundo lapponica* Wahlenb. Fl. Lapp. 27, t. i. (1812).—A species of northern Europe, represented with us by:

Var. **brevipilis**, n. var., a forma typica differt pilis brevioribus ⅔ longitudine lemmatis; innovationibus pluribus.

Callus-hairs short, ⅔ the length of the lemma: innovations numerous.—QUEBEC: abundant in sand or bogs on the gneiss plain, Blanc Sablon, Straits of Belle Isle, *M. L. Fernald & K. M. Wiegand*, no. 2547 (TYPE in Gray Herb.).

Calamagrostis lapponica is intermediate in its characters between all three of the divisions of the *Quinquinerviae*. The typical form has the long copious hairs of § *Calamagris*, while it has the thick lemma of § *Deyeuxia*, with the short palea of the subsection *Orthoatherae*, and a bent, slightly geniculate awn, approaching that of the subsection *Ancylatherae*, although the awn is not twisted at the base, as it is in the species of that subsection. Dr. Eric Hultén (Fl. Kamtchat. 107) implies that its pollen is sterile, which leads to the supposition that its intermediate characters may be due to hybridization. The American form, with its short, unequal callus-hairs, belongs clearly in § *Deyeuxia*.

The writer has not seen material of *Calamagrostis lapponica* var. *groenlandica* Lange, Consp. Fl. Groenl. ii. 296 (1887), described as differing from the European form in its short callus-hairs and straight awn, but it seems doubtful that with those characters it could be placed in this species. It may be an aberrant form of *C. neglecta* or *C. hyperborea*, or, as suggested above, *C. canadensis* var. *arcta*.

In concluding, the writer gratefully acknowledges the invaluable aid of Professor M. L. Fernald, under whose direction this work was carried out. He also expresses his gratitude to Professor A. S. Hitchcock, for his assistance in giving access to the specimens in the National Herbarium, to Dr. M. O. Malte, for his generous loan of a type-sheet, and to Miss Sanderson, librarian at the Gray Herbarium for her aid in securing obscure literature.

Explanation of Plate 195

Fig. 1, Calamagrostis canadensis, spikelet × 5, from Kennebunkport, Maine, *G. G. Kennedy*. Fig. 2, C. canadensis var. robusta, spikelet × 5, from Sand Bank, west of Burgeo, Newfoundland, *Fernald, Long, & Fogg*, no. 91. Fig. 3a, C. canadensis var. Langsdorfi, spikelet × 5, from Tunugliarfik-Fjord, Kiagtût, Greenland, *A. E. Porsild & M. P. Porsild;* fig. 3b, panicle × ½, fig. 3c, ligule × 2. Fig. 4, *C.* Scribneri, spikelet × 5, from near Pagosa Peak, Colorado, *C. F. Baker*, no. 160. Fig. 5a, C. canadensis var. arcta, panicle × ½, type specimen from head of Nachvak Bay, Labrador, *R. H. Woodworth*, no. 62; fig. 5b, ligule × 2. Fig. 6a, C. inexpansa var. brevior, panicle × ½, from base of cliffs, Mt. Willoughby, Vermont, *E. & C. E. Faxon;* fig. 6b, spikelet × 5. Fig. 7a, C. inexpansa var. novae-angliae, panicle × ½, type specimen from woods, Mt. Desert Island, Maine, *E. F. Williams & E. L. Rand;* fig. 7b, spikelet × 5; fig. 7c, ligule × 2. Fig. 8, C. hyperborea, spikelet × 5, from Neria, Greenland, *J. Eugenius*. Fig. 9, C. lapponica var. brevipilis, spikelet × 5, type specimen from Blanc Sablon, Quebec, *Fernald & Wiegand*, no. 2547. Fig. 10, C. labradorica, spikelet × 5, from Magpie, Quebec, *Victorin & Rolland*, no. 18,242. Fig. 11a, C. neglecta, spikelet × 5, from mouth of Bonaventure River, Quebec, *Williams & Fernald;* fig. 11b, ligule × 2.

(*To be continued*)

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—V

Norman C. Fassett

Scirpus heterochaetus Chase. Although local, this species is abundant in a few places in Wisconsin. In Lake Puckaway, Green Lake County, it covers many acres, growing in shallow water with *S. validus* and *S. acutus*. It is represented by the following collections: north side of Lake Puckaway, *F. M. Uhler & W. T. McLaughlin* no. 355; south side of Lake Puckaway, Marquette, *Uhler & McLaughlin* nos. 356 & 357. Mr. Uhler tells me that he has seen it in several places along the Mississippi River bottoms in this state, but we have only one collection from that region. This is from Pepin, *N. C. Fassett & L. R. Wilson* no. 4351. Here it grew in one large colony bordering a small lake separated from Lake Pepin by a sand bar. I have also taken it in Burnett Co.: sandy shore of Long Lake, Hertel, *Fassett* no. 7795. Here it was apparently not abundant.

Echinochloa Walteri (Pursh) Nash. The range of this species was reported in Gray's Manual, ed. 7, as from "N. H. to Fla.; and in w. Ont. and n. Ill." Hitchcock, in 1920,[1] extended this range northwestward by citing a specimen from Sauk City, Wisconsin,

[1] Contrib. U. S. Nat. Herb. xxii. pt. 3, 139 (1920).

and the next year Wiegand[2] cited a specimen as "Wisconsin: 1861, *T. J. Hale.*" Hale's collection was probably from the vicinity of Madison, where this species is represented by many collections, including the following: Dead Lake [Lake Wingra], August, 1885, *L. H. Pammel;* Dead Lake, September 19, 1890, *R. H. True;* University Bay [part of Lake Mendota], September 1, 1909, *J. R. Heddle* no. 2T269; University Bay, September 20, 1916, *E. A. Baird;* University Bay, September 7, 1920, *J. J. Davis.* The writer has seen it at both of these localities in recent years, as well as on Lake Waubesa a few miles south of Madison.

E. Walteri was excluded from the flora of Minnesota by Rosendahl and Butters,[2] but the writer has collected it in Wabasha County, Minn., in a quaking bog on the Mississippi River bottoms: Weaver, *N. C. Fassett & N. Hotchkiss* no. 2906. It was also found (in this case f. *laevigata* Wiegand) by Mr. W. T. McLaughlin near the Minnesota line: sandy shore of Yellow Lake, Webster, *McLaughlin* no. 358. Mr. A. M. Fuller writes me of a sheet in the Milwaukee Public Museum: Mississippi River bottoms, Grant County, Wisconsin, *H. H. Smith.*

The occurrence of this essentially coastal plain species in three localities in the unglaciated area (Sauk City, on the Wisconsin River; Weaver, Minnesota, and Grant County, Wisconsin, on the Mississippi River) is interesting in view of the hypothesis that such plants followed the glacial margin in their migrations westward.[3] Did it follow the terminal moraines across southeastern Wisconsin until it reached the Wisconsin River, then spread down that stream, up the Mississippi and even up the St. Croix to Yellow Lake? It is decidedly rare along all these rivers.

The Fox River, flowing into Lake Michigan, heads near Portage, Wisconsin, so close to the Wisconsin River that a canal is maintained between the two streams. The route of Marquette and Joliet on their first voyage to the Mississippi was up the Fox and down the Wisconsin Rivers. The Fox River, as a possible route for coastal plain migrants, was visited in the fall of 1929. Here, in company with such plants as *Bidens discoidea*, *Juncus Greenei*, and the typical *Zizania aquatica*,[4] were found extensive swales of the *Echinochloa.*

[1] Rhodora xxiii. 62 (1921).
[2] Minnesota Botanical Studies iv. 467 (1916).
[3] See Peattie, Rhodora xxiv. 57–70,80–88 (1922).
[4] See Rhodora xxvi. 156 (1924), and xxix. 228 (1927)

The following collections were made, in each case on the shores of natural enlargements of the Fox River: Marquette Co.: margin of Buffalo Lake, Montello, *Fassett* no. 8830. Green Lake Co.: north shore of Lake Puckaway, *Fassett* no. 8829; south shore of Lake Puckaway, Marquette, *Fassett* no. 8801.

Other collections in Wisconsin, all in the southeastern part, are: Milwaukee Co.: Bay View, *F. Runge*.[1] Dodge Co.: Fox Lake, *H. L. Ward*;[1] Horicon Marsh, Horicon, *Fassett* no. 8831.

Galium boreale L., var. typicum Beck von Man. In Wisconsin as follows: Sauk Co.: marshy uplands, Baraboo, July 7, 1891, *R. H. True*. Dane Co.: near R. R., abundant, South Madison, June 2, 1903, *Pauly*. "The only specimens in the Gray Herbarium and the herbarium of the New England Botanical Club from east of Manitoba are one each from northern New Hampshire, northern Vermont and northern New York."[2]

Bidens coronata (L.) Britton; not Fisch. (*B. trichosperma* (Michx.) Britton). Reported in Gray's Manual, ed. 7, from "Mass. to Va. near the coast; also N. Y. to Ill. and Ky.; said to extend northwestw. to Minn.," this plant proves to be abundant in wet places across the southern half of Wisconsin, occurring northward as far as Clark and Shawano Counties. *B. aristosa*, reported as from "O. to Mich., Minn., and southwestw.", a range which seems to include southern Wisconsin, appears to be absent from this state. Of the many herbarium sheets here and at the Milwaukee Public Museum, marked *B. aristosa*, all that bear mature fruit are clearly *B. coronata*.

Madison, Wisconsin.

THE AUSTIN COLLECTION FROM THE LABRADOR COAST

Harlow Bishop

During the summer of 1928, Dr. Oliver L. Austin of Tuckahoe, New York conducted a third expedition to the coast of Labrador. An intensive survey of the bird fauna of the outside islands, the large number of which lends hazard to navigation in this part of the world, formed the guiding motive of the venture. Oliver L. Austin, Jr., a

[1] Specimen in the Herbarium of the Milwaukee Public Museum.
[2] Fernald, Rhodora xxx. 107 (1928).

student of ornithology at Harvard University, made a critical collection of the rare and interesting birds of the coast, but concentrated particularly on the banding of young birds, in order to secure new data on migrational routes.[1] The writer was fortunate to be a member of the party and to be privileged to make a parallel survey of the flora, under the authorization of the Gray Herbarium.

Twenty stations were the site of collections along the southern and central parts of the coast, from Battle Harbor (lat. 52° 15′, long. 55° 35′) on the south to Tikkoatokok Bay (lat. 57°, long. 62°) on the north, representing a stretch of some four hundred miles. From all but relatively few of these, previous collections have been made. The long and finely discriminating activities of the Moravian missionaries, since the inception of their influence in 1732, though chiefly at Hopedale, at Nain and at Okkak, have contributed greatly to our knowledge of the flora of Labrador.[2] The number of additions to the flora, that have been made as a result of the present expedition, was therefore not large, but the weather was so favorable that nearly two thousand sheets of material were brought back for examination and exchange.

The vegetation shows, in exposed situations, the general depressed habit of the crowberry, *Empetrum nigrum*, and the bearberry, *Arctostaphylos alpina*, but becomes a low forest of black spruce, *Picea mariana*, with a dense lichen turf, mostly of *Cladonia alpestris*, in sheltered valleys. The conspicuous Canadian character of the flora of at least this section of the coast is in line with what one would expect from the physiographic history of the region. The age, origin and affinities of the flora appear to have a definite relation to the extensive glaciation in recent geologic times. The potency of this factor is easy to see in the almost total absence of soil, the low, rounded hills of essentially uniform height and the countless boulders everywhere to be seen. The rarity of such forms as *Puccinellia tenella, Dupontia micrantha*, and *Koenigia islandica* would seem to point to the disappearance of the older arctic flora of the region, and the dominance of such forms as *Picea mariana*, *Abies balsamea*,

[1] The results have been summarized in a preliminary way in "Migration Routes of the Arctic Tern," O. L. Austin Jr., Bull. Northeastern Bird-Banding Assoc., Vol. IV, No. 4, Oct., 1928.

[2] The first critical notes on the flora of Labrador, based on these collections, were published by R. R. von Schranck as "Aufzählung einiger Pflanzen aus Labrador, mit Anmerkungen." Denkschriften der König-Baier. Bot. Gesellschaft, Zweite Abt., 1815. Regensburg.

Calamagrostis canadensis var. *robusta, Carex brunnescens, C. leptalea, C. vaginata, Juncus filiformis, Streptopus amplexifolius, Habenaria dilatata, Alnus crispa, Coptis groenlandica, Drosera rotundifolia, Ribes glandulosum, Amelanchier Bartramiana, Viola pallens, Cornus canadensis, Trientalis borealis, Menyanthes trifoliata* var. *minor, Viburnum pauciflorum,* and *Solidago macrophylla* var. *thyrsoidea,* points to the invasion of a more southern flora. A parallel case has been proved for the flora of Europe, where the glaciations were even more protracted and more devastating to the original flora than in northern America. But the efficacy of this factor in the distribution of plants has been set forth most clearly by the intensive study of the flora of Newfoundland and of the Gaspé Peninsula.[1] The spread northward of Canadian types at the close of Pleistocene times thus appears to be the main clue to the origin of the Labrador flora.

The present collection was identified at the Gray Herbarium, Harvard University, under the direction of Professor M. L. Fernald. The following numbers have been considered by him worthy of note.

No. 55. HIEROCHLOE ODORATA (L.) Wahlenb. var. FRAGRANS (Willd.) Richter. This is the common vanilla grass, but represents a slight northern extension from the Straits of Belle Isle to Petty Harbor (lat. 52° 25′, long. 55° 40′).

No. 70. DANTHONIA INTERMEDIA Vasey. A species with unusually large spikelets and a disrupted range, known from the Rocky Mountains to the Pacific, in Kamtchatka, on the Shickshock Mountains of Gaspé and the mountains of western Newfoundland. This is the first station north of Newfoundland, at Mokkovik (lat. 55° 10′, long. 59° 15′).

No. 86. PUCCINELLIA TENELLA (Lange) Holmb. This dwarf, tufted grass, originally described from Nova Zembla and subsequently recorded from Greenland and from Cape Chidley in northernmost Labrador, was found on a small rock island, fifteen miles northeast of Ford Harbor (lat. 57°, long. 62°), thus extending its range south from Cape Chidley.[2]

No. 101. ELEOCHARIS UNIGLUMIS (Link) Schultes. A circumpolar species which has been but recently recognized in America. Its collection at Paradise River, Sandwich Bay (lat. 53°, 30′, long. 57°, 15′) furnishes the most northern material in extreme eastern America.

Nos. 111 and 111b. CAREX GYNOCRATES Wormsk. The range of this diminutive sedge in continental eastern America has been extended considerably northward from the Straits of Belle Isle to Hopedale (lat. 55° 27′, long. 60° 12′).

[1] For a significant discussion of these regions see M. L. Fernald, "Persistence of Plants in Unglaciated Areas of Boreal America." Mem. Amer. Acad. of Arts and Sciences, Vol. XV, No. 111, 1925.

[2] Simmons, H. G. Phytogeogr. Arct. Am. Archipel. 52, 1913.

No. 113. Carex exilis Dewey. A common sedge to the south, its known range now extended northward from the Straits of Belle Isle to Makkovik (lat. 55° 10′, long. 59° 15′).

No. 141. Carex livida (Wahlenb.) Willd. var. Grayana (Dewey) Fernald. The range extended northward from the Straits of Belle Isle to Makkovik (lat. 55° 10′, long. 59° 15′).

No. 166. Carex Lyngbyei Hornem. The purple-black spikes of this coarse sedge render it particularly conspicuous at Gready Island (lat. 53° 50′, long. 56° 20′). It is widely dispersed in northern Eurasia but has heretofore been known in America only from Greenland and from Alaska to Oregon.

No. 179. Juncus arcticus Willd. This species has been known from arctic regions, the shores of Hudson Bay, and from Alaska to Alberta. This is a southern extension from Baffin Land to the Fraser River (lat. 57°, long. 62°).

No. 230a. Corallorhiza trifida Chatelain. This species of coral root has not been known north of Newfoundland and its present collection represents an extension northward in range to Hopedale (lat. 55° 27′, long. 60° 12′).

No. 275. Alnus incana (L.) Moench. A common alder of New England and eastern Canada, its known northern limit is extended from the northern shore of the Gulf of St. Lawrence to Paradise River, Sandwich Bay (lat. 53° 30′, long. 57° 15′).

No. 334. Roripa hispida (Desv.) Britton var. glabrata Lunell. Extended north from the north shore to the Gulf of St. Lawrence to Paradise River, Sandwich Bay (lat. 53° 30′, long. 57° 15′).

No. 525. Veronica scutellata L. The present specimens of this purple-flowered herb represent the dwarf northern extreme of the species. Their collection at Tikkoatokok Bay (lat. 57°, long. 62°), records it for the first time from the Labrador peninsula, the previous northeastern records being from Newfoundland.

No. 590. Aster foliaceus Lindl. var. frondeus Gray. The former eastern range of this variety, characteristic of the Rocky Mountains, the Gaspé Peninsula, and western Newfoundland, has been extended north to Makkovik (lat. 55° 10′, long. 59° 15′).

No. 592. Antennaria isolepis Greene. The station at Cape Harrigan (lat. 55° 50′, long. 60° 20′) is slightly south of the previously known southern limit at Port Manvers.

No. 608. Hieracium groenlandicum Arvet-Touvet. The frequency of this species of hawkweed along Labrador, and on Newfoundland and Anticosti Island, calls into doubt its consideration as an endemic of Greenland. The present material was collected at September Harbor (lat. 57°, long. 62°).

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